FOURTH REPORT OF THE WELLCOME TROPICAL RESEARCH LABORATORIES, KHARTOUM

Volume A - Medical (General Report)

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OF THE

WELLCOME TROPICAL RESEARCH LABORATORIES

AT THE

GORDON MEMORIAL COLLEGE KHARTOUM

VOLUME A.—Medical

ANDREW BALFOUR, M.D., B.Sc., F.R.C.P. Edin., D.P.H. Camb.
DIRECTOR
Fellow of the Royal Institute of Public Health, the Society of Tropical Medicine and Hygiene, and the Incorporated Society of Medical Officers of Health; Member of the Association of Economic Biologists; Corresponding Member Société de Pathologie Exotique and American Society of Tropical Medicine; Medical Officer of Health, Khartoum; etc.

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Kala-azar Commission

to investigate the Prevalence and Cause of the Disease in the Eastern Sudan

(1) General Report

BY

Captain D. S. B. Thomson, M.B., B.Ch., B.A.O., D.P.H., R.A.M.C.

Attached Egyptian Army

The Commission, which was appointed by the Sudan Government, left Khartoum on November 3, 1909, on board the steamer *Culex*, with which was the Wellcome Tropical Research Floating Laboratory. Both of these were kindly placed at our disposal by the Director of the Wellcome Tropical Research Laboratories, Khartoum.

It was decided that one of us, the pathologist, should remain in Singa with the Laboratory, the other travelling through the country to determine the area of prevalence of the disease, and if possible its cause.

Tours of inspection

On arrival at Singa, it was decided to make a series of tours of inspection, each taking about two months.

The first, from Singa to Roseires, going south by the west bank and returning north by the east bank.

The second, from Singa to Gedaref, thence to Gallabat, visiting the surrounding villages and returning to Gedaref and Singa by different roads where possible.

The third tour, south to Karkoj, thence east to Khor Agaliin and thence south along the west bank of River Dinder as far as the Khor Galegu, returning north by the east bank visiting all the villages as far north as Bardana, and returning to Singa.

The fourth tour, north to Sennar by the west bank, returning to Singa by the east bank.

The fifth tour, south-west from Singa to Dar Agil, thence north along Khor Um Esh to Teigo and thence north-east still along the Khor to Hillet Howeires and back to Singa.

These five tours took eight months of actual travelling, the last one extending into the month of July, after which, owing to the rains having started and the presence of "fly," camels could no longer be employed.

In all 219 villages were visited and 2,100 miles covered by camel and river.

The time spent in each village varied according to its size. In the larger villages three days were necessary, whereas in the smaller, one day was sufficient to see all the inhabitants and sick. As far as possible a stop of at least one day was made in each place.

Naturally, general medical work was predominant and no difficulty was found in getting the natives to come for treatment. No accurate record was kept of the number of cases treated, but at the lowest computation at least 3000 men, women and children were treated or given advice.

Procedure in villages

On arriving in a village the procedure was as follows:—

The Sheikh was told to warn the people of the English doctor's presence, his willingness to see all sick, and visit in their houses those unable to come to him, and that all medicine, etc.,

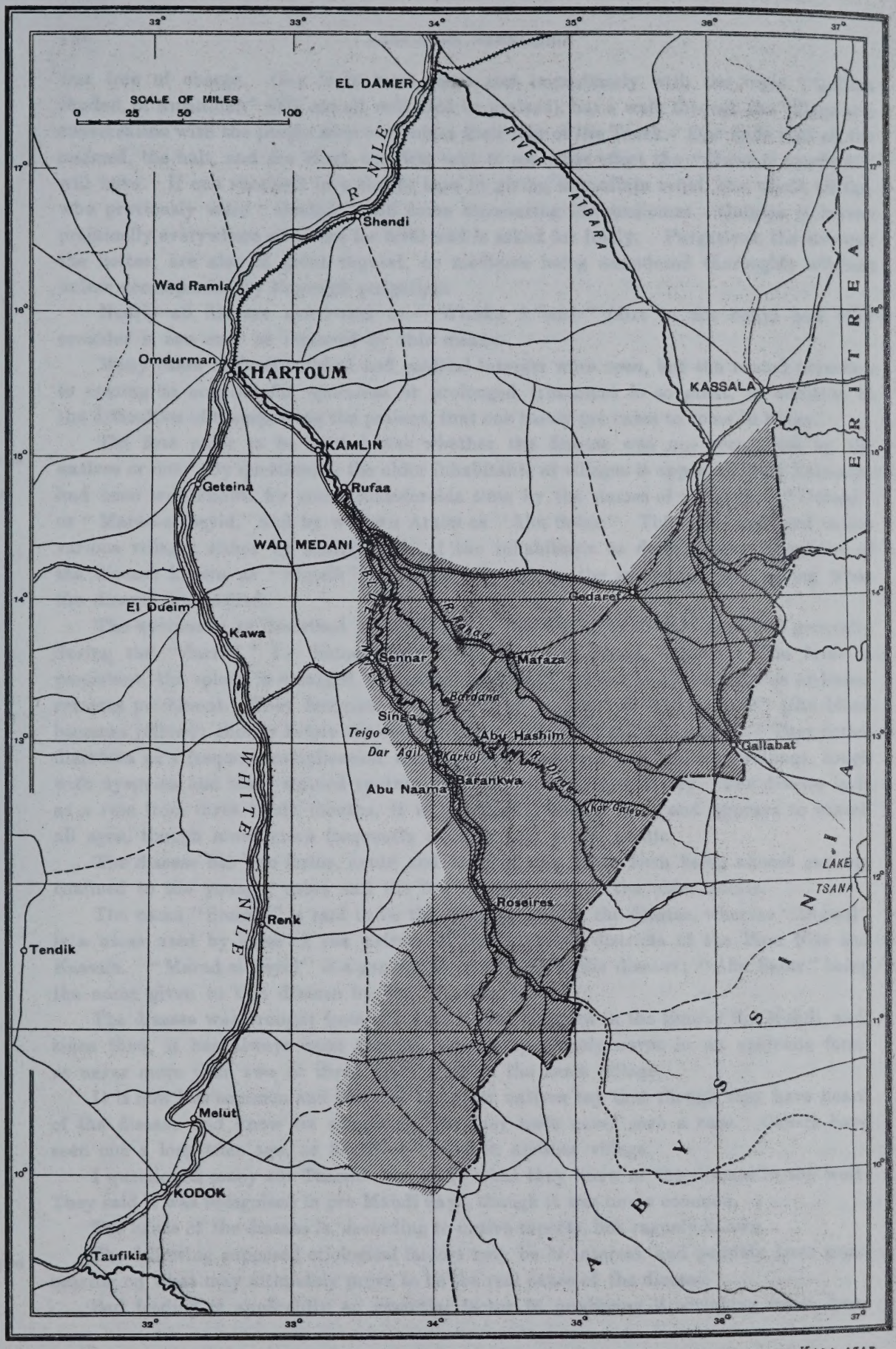


FIG. 36.—MAP OF EASTERN SUDAN SHOWING AREA KNOWN AT PRESENT TO BE INFECTED WITH KALA-AZAR

was free of charge. One is in most cases met immediately with the reply "Qullina shudad, bi Amanillah" (We are all well, God be praised), but a walk through the village and conversation with the people soon overcomes their fear of the Tourk. One finds that all the maimed, the halt, and the blind, are first sent to see what effect the "Dawa el tourkowi" will have. If one succeeds in a simple case in giving immediate relief, the whole village, who previously were "shudad," will come clamouring for medicines. Quinine is known practically everywhere as a cure for fever and is asked for freely. Purgatives, the stronger the better, are also in great request, no medicine being considered thoroughly efficient unless accompanied by thorough purgation.

Nearly all ills are attributed to "Wisaka fi butn" (dirt in the belly) and they consider it can only be removed by this means.

Many cases of both surgical and medical interest were seen, but the rooted objection to coming to hospital for operation or prolonged treatment is so great, in addition to the difficulties of transporting the patient, that one rarely got cases to come to Singa.

Native information on Kala-azar

The first point to be settled was whether the disease was one recognised by the natives or not. By questioning the older inhabitants of villages it appeared that kala-azar had been well known for some considerable time by the names of "Simeih," "Dobaal" or "Marad-el-Seyid," and by western Arabs as "Abu Safar." This was confirmed in the various villages either by asking some of the inhabitants to describe the symptoms of the disease known as "Simeih" or else by describing the symptoms and asking what the disease was called.

The symptoms as described by them are as follows. The disease appeared generally during the "darrad," *i.e.* immediately after the rains, about October. The fever is persistent, the spleen is enlarged, the patient gradually wastes away, though his abdomen remains prominent. They describe the anæmia by saying "El damm asfar" (the blood becomes yellow); shortly before the end, swellings of the feet and face appear. They notice diarrhœa as a frequent complication, also epistaxis, cancrum oris, sudden swellings, cough with dyspnœa and blood-stained sputum, but these latter, more rarely. The disease lasts as a rule from three to six months, it is practically always fatal and appears to attack all ages, though much more frequently children and young adults.

The disease has two forms, acute and chronic, the acute form being almost entirely confined to the younger cases and the few chronic ones to the older adults.

The name "Simeih" is said to be the Baggara one for the disease, whereas "Dobaal" is a name used by some of the natives of the Southern districts of the Blue Nile and Kassala. "Marad-el-Seyid" is a general term applied to the disease; "Abu Safar" being the name given to this disease by the Western Arabs.

The disease was brought from the west by the Baggara in the time of the Mahdi, and, since then, it has always been present, though apparently never in an epidemic form, as never more than two or three cases were in the same village.

It is now less common and some of the older natives say that though they have heard of the disease and know its symptoms, yet they have never seen a case. Others have seen one a long time ago, or heard of a case in another village.

I questioned many old Taaishi men as to what they knew of the disease in the west. They said it was recognised in pre-Mahdi days, though it was never common.

Cause of Disease according to Native Report

The cause of the disease is, according to native reports, but vaguely known.

The following supposed etiological factors may be of interest, and possibly have some bearing on what may ultimately prove to be the real cause of the disease.

Bad feeding is apparently an essential factor in producing it, drinking water from

wells which have been flooded during the rains, using *Weykab* with food, eating *Mandaki*, sleeping on the ground at the beginning of the rains and so inhaling the vapours which arise from the warm moist earth, all these have been given as causes of kala-azar. Some consider the disease highly infectious and won't eat or drink from the same vessels as the patient or sleep in the same house.

Weykab is made as follows :—

Dura stalks are heaped on the ground and burnt, the ashes collected and put into a *Gurra*, in which there is a small hole at the bottom. Water is poured on to this and filters through into a second vessel. The filtrate is light yellow in colour and slightly saline in taste and is used with food instead of salt, when salt is unobtainable or the people too poor to buy it.

Mandaki is a strong-smelling preparation of raw pounded fish, bones included, made into balls and hung up in the *tukl*, pieces being broken off as required. These fish balls are made either from a mud fish called *Garmout*, or else from *Seer* which they say is a young form of the fish known as *Daps*. Both *Weykab* and *Mandaki* are only used by the very poorest people, and, under exceptional circumstances, by others.

All these alleged causes would seem to point to an intestinal infection caused by food or water getting contaminated by soil.

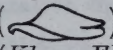
Some years ago in the Dahari of the Gezira west of Wad Medani, I saw several cases of night blindness which were attributed to the excessive use of *Weykab*.

I wish to thank the Inspector-General, Sir Rudolph Baron von Slatin Pasha, for the following interesting information as regards native treatment which he kindly sent me.[1] Native Treatment

"The disease which the natives of the Northern Districts in the Sudan call 'El Semeih,' is called by the Taaisha Tribes of the West 'Abu Safar,' which means 'father of yellow.'

"It commences with strong fever, the body loses all its flesh and the colour of the skin becomes extremely pale; the abdomen increases considerably in size and the tongue turns white.

"The process of natives in the treatment of this disease is as follows :—

"They take the root of a climbing shrub, called *El Lawia*, whose leaves are of this shape () and that of another shrub called *El Debeigha*, and mix them with 'Iron scale' (*Khara-El-Hadid*), and a handful of red pepper (*Shatta*). All this is pounded into powder. A young he-goat is then slain and skinned; and the head, feet and inside being discarded, the remainder is cut into small pieces and put into a large pot filled with plenty of water. This is mixed with the powder thus prepared, the pot is placed on the fire in the evening and caused to boil for some six hours.

"At daybreak, the patient is first given about ½ a rotl of *Semn* (butter) and then about the same quantity of the prepared broth and a few slices of the boiled bitter goat-meat.

"The effect is that of a very strong purgative, and the same treatment should be repeated for three times in succession (it is advisable to take the broth of this purge a little warm), while at the end of the three days the patient should consume *Semn* in large quantities for another three days, and the diet should consist of meat, bread, milk, but no vegetable such as *Weika*, or what the Sudanese call *El Durraba*."

These shrubs exist in districts south of Sennar, but the natives do not use them.

I questioned some of the older Taaishi on the Blue Nile and they confirmed this, and say that the plant is known here also as *El Lawia*, though the natives of the district were ignorant of its use. So far as I could find out, there is no recognised treatment for the

[1] Statement made in Arabic by "Western Arabs."—R. Slatin

disease on the Blue Nile beyond the regulation native procedure of purgatives, drinks of tannin, etc., cupping, both wet and dry, over the spleen, and blistering or firing, all of which are used in cases of enlarged spleen, and fever.

Infection of Riverain and Inland Villages

During the various tours, both riverain and inland villages were visited. Judging from the number of cases found and reported the disease is unquestionably more common in riverain villages.

Of the various districts visited, beyond doubt the most heavily infected are the Merakiz of Singa and Abu Naama.

Practically all the cases found came from this area. Barankwa was the only place in which more than one case was found.

The villages of Tama and Beheiga may be mentioned as of especial interest.

These villages are situated about 200 yards back from the river on Azaza soil, *i.e.* a light kind of soil, and about 500 yards apart. The ground has a natural slope on all sides and trees are cleared away from the villages for a very considerable distance. In fact, the sites would appear to be ideal ones, yet during the past six years the people have lost so many of their relatives and children, from, they say, "Simeih," that the greater number of them have left the villages, and the remainder wish to go. This has been arranged for. They state that the first year they came there they were healthy and well, but that then the disease began and killed them off, as many as five in the year dying of it.

On the occasion of my first visit I examined all the remaining people of the two villages but could find no trace of the disease in any of them. Nor was I able to get any information about the origin of the disease there, as to whether the first case had been elsewhere, or in contact with an infected patient, or come from a village in which the disease was present.

In the village of Tama the Sheikh reports a case of mother and child being infected and both dying, the mother showing signs of the disease one month after her son's death. This is the only case in which there has been any record of more than one member of a family being infected.

Comparison of number of Cases in Provinces

The comparative figures of cases in various provinces are interesting.

Captain Bousfield, in his report last year, states that of 42 cases reported up to May, 1909, 15 were from the Blue Nile. Of the 41 new cases reported by us during 1909–10, 36 have been seen or reported in Sennar Province.

These figures are very striking, though the fact that the greater part of the time of the Commission was spent in this province, may account for so few cases being noted in Kassala Province, where only six weeks were spent, the reason for this being that it was deemed better to devote the greater part of our time to, as yet, unvisited districts.

Question of Introduction from Abyssinia

The suggestion has been made that the disease is introduced into the Sudan from Abyssinia. The arguments in favour of this as regards Kassala Province are justifiable, though there is no evidence to show that the disease itself exists in Abyssinia. It also might be argued that the habits of the Abyssinians would make them particularly prone to infection in a country in which the disease already exists.

As regards Sennar Province I do not think that the disease can be attributed to Abyssinian sources. The number of Abyssinians coming as far north as, say, Singa is small, and certainly in no town on the Blue Nile is there anything like the colony of these people that one finds in Kassala, Gedaref and Gallabat.

The total number of Abyssinians in Singa is 14, which is a very small percentage of the total population of the chief town of Sennar Province. I think that a great deal more evidence will be required in support of this theory before it can be accepted.

The question of the disease being endemic or epidemic is most important. Epidemic or Endemic?

From all the information obtainable, undoubtedly the weight of evidence is in favour of the disease having been present in the country for many years.

Also it apparently used to be much more prevalent in certain districts than at present, though in no case could I get any information of its occurrence in true epidemic form.

Certainly, in some instances, there would appear to have been small epidemic outbreaks of the disease, *e.g.* the village of Tama. It is difficult to say whether these outbreaks are premonitory of a severe epidemic or merely the last epidemic flicker of a disease which is becoming endemic. In other words, that the epidemic has left behind a sporadic affection.

The latter seems to be the more likely solution under the circumstances.

As regards transmission, the accepted theory, at present, is that the vector is *Cimex rotundatus*, yet this bug has never been found in any of the infected areas of the Sudan. Method of transmission

The native information on the subject would favour an intestinal infection and the possibility of this mode of infection should not be lost sight of. This subject will be fully dealt with in the pathological report (*vide pages* 157–172).

The possibility of infection from animals must also be considered. The *tukls* of natives generally hold at night, all or nearly all the following animals: goats, sheep, hens, pigeons and perhaps a litter of puppies, in addition to three or four human beings. No animals suffering from disease were noticed in the houses of any of the patients.

In several villages I heard of and saw outbreaks of spirochætosis amongst the fowls of the natives. Also outbreaks of *Abuini* had killed off nearly all the goats of some villages.

This is a disease apparently affecting the lungs and is very rapidly fatal. I myself saw no animals actually suffering from this condition.[1]

The procedure on finding a case of kala-azar was as follows:— Procedure on finding case of Kala-azar

The parents of the patient were told that he was suffering from "Simeih," and the advantage of transferring the case to Singa for treatment was pointed out, especially as, according to their views, the patient was bound to die, whereas if sent to Singa there was the possibility of prolonging life. They were told that the *tukl*, together with the *angareeb*, *bursh*, etc., occupied by the patient, would be burnt and ample compensation given for what was destroyed. In no case was there the least difficulty in carrying out this procedure, the parents being only too glad to grasp the possibility of saving their child's life.

When the patient had been removed to hospital, the *tukl*, etc., was burnt under personal supervision and a certificate given to the owner for the compensation, which he drew at the nearest *Markaz*.

Spleen puncture was performed in every case which was at all suspicious and in many others in which splenomegaly was the only symptom. Spleen puncture

No difficulty was met with in making spleen punctures. The skin, having been washed with soap and water, was then thoroughly rubbed with methylated spirits and painted with tincture of iodine. After the needle was withdrawn, a piece of cotton wool soaked in collodium was placed over the puncture.

A 2 c.c. all-glass syringe, with a fine needle, was used in every case. The needle was introduced just below the costal margin in every case but one, in which, owing to the small size of the spleen, the needle was inserted in the intercostal space.

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[1] This is infectious pleuro-pneumonia.—A.B.

In some cases, blood did not flow freely until the needle had been withdrawn slightly. The needle was wholly withdrawn as soon as blood appeared beyond its butt, the blood thus obtained being sufficient for many slides.

In all, 53 spleen punctures were done on tour and in no case were any unfavourable results noted. Every case was kept lying down for two hours after spleen puncture, and then carried to his house, and told not to walk about till next day. This order was often not obeyed, and I have met many cases, three hours after being punctured, walking about unconcernedly.

Age incidence

Of the 37 cases seen and reported on the Blue Nile, 24 were in boys and girls from 7 to 18, whereas of the 5 cases noted in Kassala Province, 4 were in men of from 20 to 30 and only 1 in a child.

It would therefore appear as if the type of disease found in the Sudan is very similar to that of India. In India, 50 per cent. of the cases quoted by Rogers were in children and young adults up to 20 years of age. In the report of sporadic cases at Sylhet an even higher percentage, namely 69 per cent., of cases under 20 years, is reported.

This latter percentage more nearly agrees with our observations on the subject.

Sex incidence

As regards sex incidence, of 42 cases, 8 only were females. I do not think that this preponderance of male cases is in any way due to the objection of the natives to bring their women folk for treatment, as seclusion of the female sex is not carried to such an extent in these districts as in Egypt. Many women who were unable to come for treatment or whose husbands were unwilling for them to leave their houses were visited in their houses.

Race incidence

As far as can be seen no special race shows a predisposition for the disease, all seem to be equally prone to infection.

The following table shows the race incidence :—

	Positive Kala-azar	Microscopically negative, clinically positive	Possible cases by native report
Arab	9	4	8
Sudanese	7	3	6
Egyptian	2	Nil	Nil
Abyssinian	1	1	Nil
Berbereen	1	Nil	Nil
Total	20	8	14

Seasonal incidence

As cases have been seen at various seasons of the year, it is difficult to determine the actual time of infection. From information gathered from native sources the disease would seem to show itself at the end of the rains; this would seem to favour infection taking place during the rains, the cool season.

It must be remembered that during December and January the temperature is generally low, and, assuming that a low temperature is a necessary factor in infection, it is quite possible that the disease may be contracted during these months and, lying dormant through the hot weather, only asserts itself during the following rains.

This would point to a prolonged quiescent period, though, experimentally, it has been found possible to demonstrate Leishman-Donovan bodies by spleen puncture within fifty days of infection.

As regards family distribution the disease would appear to differ from that seen in India.

In only one case was there any history of infection of the second member of a family.

Is Kala-azar curable?

The question as to whether the disease is curable is of the utmost importance and, whether a permanent cure is possible or not, is a moot point.

The following four cases which we have seen, are of interest, as they were reported as positive last year by Captain Bousfield.

Saleh Mohammed has been seen three times since last November, and on each occasion has been fit and well. On the first occasion on which he was seen both spleen and liver puncture proved negative.

The patient suggested to us that he should come again next day for further punctures as he said that since he had been first punctured, six months before, he had had no sign of fever, and this he attributed to the puncture.

Shawish Tisama was seen in February, 1910, about ten months since he was diagnosed kala-azar. He was fit and well. Spleen puncture was negative for Leishman-Donovan bodies.

Ramadan Someet, a boy about ten, seen at Gallabat a year after original diagnosis was made. He was fit and well with no fever, and spleen barely palpable.

Ali Abdel Kader. This case was diagnosed as suspicious by Captain Bousfield. When seen by us he had fever, enlarged spleen, and leucopenia. Leishman-Donovan bodies were present in the peripheral blood. He was treated with tincture of senega and, after three months' treatment, fever had ceased and parasites had disappeared from the peripheral blood. After six months' treatment the spleen was not palpable.

The treatment which these cases had was as follows:—

The first had a short course of quinine, apparently about 25 grains a day, for five days.

The second was treated first with regular doses of quinine and since November has been taking tincture of senega regularly.

The third was treated with quinine for a period of some months.

The fourth was treated entirely with tincture of senega for 5 months. None of these cases, as far as I could find out, had had any suppurative focus, or anything wrong with them which would tend to create a leucocytosis, since they were diagnosed kala-azar.

Are these four cases of spontaneous cure of the disease; is the disease simply dormant in their systems in some form of which we know nothing, or is spleen puncture of therapeutic value in some instances?

I have frequently heard natives say that spleen puncture, even in cases of malarial splenomegaly, has improved their condition and reduced the size of the spleen.

A focus of bilharziosis

A point of considerable interest, which was noted during the tour west of Singa, was the enormous number of cases of bilharziosis.

All the villages lying on Khor Um Esh would appear to be more or less infected.

This khor, which has a shallow, ill-defined bed, runs in a north-easterly direction for about 20 miles and joins the Blue Nile at Abu Shoka. During the rains it is always full and is fed by many subsidiary khors, of a similar nature to the main khor, which drain a large area. During the dry season the people dig wells in the bed of the khor, getting water about 30 feet from the surface.

In the greater percentage of cases seen, children, chiefly boys, from 5 to 15 years of age, were infected, though both men and women also suffer from the disease.

Patients complain of "Bouul Har" or scalding urine. Microscopic examination of the urine showed numbers of bilharzia ova.

The children all complained of frequent micturition and irritation of the bladder; some cases I saw passed large clots of pure blood and a very small quantity of urine with them.

Others undoubtedly, from their symptoms, had infection of the rectum as well, and were passing blood and mucus.

Several women whom I saw suffering from this disease also complained of renal and ovarian pains, which may have meant an infection of these organs also.

The heavy infection of this definite area with bilharzia is of exceeding interest as, up to the present, only isolated cases of bilharziosis in Sudanese and Arabs have been recorded, and so far as I know no definite infected area has been reported. Samples of water were taken from the wells of Hillet Howeires, in which at least two-thirds of the boys appear to be infected.

The examination of the water showed considerable deposit, chiefly earth and sand, with some vegetable debris. Flagellated and ciliated bodies were present in considerable numbers.*

Recommendations

Recommendations

1. That a special-service British Medical Officer with a knowledge of kala-azar be appointed to Sennar Province for the further investigation of this disease. That he be given full power of isolating cases and contacts as he may think fit.

2. That he make further experiments to determine, if possible, the mode of infection. We think that, owing to the wide-spread distribution of the cases and the absence of epidemics, animal experiments, which we have found to be easy and practicable, promise the best results.

3. All Medical Officers serving in infected districts should be thoroughly cognisant of the clinical features of the disease and instructed in making proper peripheral blood films, which they should send to some competent authority for examination.

4. In infected areas all sanitary barbers who have not been as yet instructed in the symptoms of the disease, should be instructed therein without delay.

5. They should be ordered to report all suspicious cases to the Medical Officer of their district, and, as an incentive to the discovery of all cases, they should be given a reward of P.T. 25 for every positive case reported.

6. Officials and employees of the Government suffering from fever should not neglect such attacks, especially if persistent, but consult a Medical Officer. It is possible that kala-azar in its early stages is a curable disease.

7. All officers, employees, etc., should take prophylactic doses of quinine during the *Kharif*.

8. Owing to the, as yet, uncertain method of transmission of the disease, preventive measures of a general sanitary nature should be generally carried out.

(*a*) Personal cleanliness and house cleanliness are of importance. Should the disease be carried from person to person neglect of this fact is dangerous.

(*b*) Especial attention should be given to absolute cleanliness of kitchens, cooking and table utensils and food. Water should be filtered or boiled.

(*c*) Cleanliness of villages is essential, and we would suggest that Sheikhs be held responsible for this. A dirty and insanitary village might be the starting point of an epidemic.

* Enquiry showed that infection in all probability was acquired through the skin owing to the habit of paddling about in the infected pools formed round the wells.—A.B.

(*d*) The present system of putting animals at night in zerebas adjoining the owner's *tukl*, and in some cases in their *tukl*, is to be condemned.

(*e*) That *tukls* of infected cases and all such belongings as cannot be thoroughly disinfected be burnt.

(*f*) Should an extensive outbreak of kala-azar occur in any village, the whole village should be burnt and a new village built on a fresh site, after the patients and contacts have been isolated.

9. A careful record of all cases of kala-azar should be sent half-yearly by Senior Medical Officers of Provinces to the Principal Medical Officer.

Conclusion

In conclusion, we wish to express our best thanks to the Principal of the Gordon College and the Director, Wellcome Tropical Research Laboratories, for so kindly placing their steamer and floating laboratory at our disposal.

To the Governor and Officials, both English and Egyptian, of Sennar Province for the great assistance they have given us in carrying out our investigations. To Captain Bousfield, R.A.M.C., whose report on kala-azar was most useful to us in our researches, and to El Yousbashi Nesib Eff. Barudi, S.M.D. for his invaluable help both in our clinical and pathological work in Singa.

CASES OF KALA-AZAR FOUND BY COMMISSION

Name	Sex	Age	Nationality	Village	Markaz	Province	Peripheral Blood	Spleen Puncture
Ali Wad Toto	M.	10	Sudan.	Wad El Aies	Singa	Sennar	+	+
Gasm El Seed Wad Hay Doub ...	M.	10	Arab	Abu Hogar	Singa	Sennar	+	+
Fatma Bint Izz	F.	13	Arab	Barankwa	Abu Naama	Sennar	+	+
Abdl Sadik Wad Omar	M.	14	Arab	Barankwa	Abu Naama	Sennar	+	+
3027 Nafar Mohd., Abdel Rahim, Wks. Dept.	M.	23	Egyp.	Gedaref	Gedaref	Kassala	—	+
1225 Nafar Osman Bergaz, A. Bn.	M.	25	Arab	Gedaref	Gedaref	Kassala		+
Ali Eff. Gadein Katib	M.	25	Sudan.	Gallabat	Gallabat	Kassala	+	+
Abdulla Wad Barood	M.	10	Sudan.	Taufikia	Singa	Sennar	+	+
Sabah El Kheir Wad Tiah ...	M.	12	Sudan.	Mansoura	Singa	Sennar	+	+
Zeinab Bint Bakhat	F.	11	Arab	Hariri	Singa	Sennar	+	+
Ahmed Adam Adam	M.	33	Arab	Karkoj	Abu Naama	Sennar	+	+
Ibrahim Wad Beshir	M.	11	Arab	Launi	Abu Naama	Sennar	+	
Egyptian	M.	34	Egyp.	Abu Naama	Abu Naama	Sennar	+	+
Gasmallah Mohd.	M.	19	Arab	Mafaza	Mafaza	Kassala	+	+
Kassala Abu Gaada...	M.	25	Sudan.	Roseires	Roseires	Sennar		+
Mohd. Ewad El Seed	M.	12	Arab	Shellal	Singa	Sennar	—	+
Yusef El Tigani	M.	9	Arab	Tangaru	Abu Naama	Sennar	+	+
Yadisa Kataba	M.	19	Abys.	Singa	Singa	Sennar	+	+
Abbas Abdel Beyen...	M.	10	Arab	Singa	Singa	Sennar	+	+

Name	Sex	Age	Tribe	Religion	Profession	Education	Remarks
Ali Wad Taha	M.	40	Gaalin	Muslim	Farmer	+	+
Omer El Fadl Wad Idris	M.	35	Arab	Muslim	Merchant	+	+
Fatima Bint Isa	F.	28	Arab	Muslim	Teacher	+	+
Abdel Hadi Wad Omar	M.	44	Arab	Muslim	Farmer	+	+
Hadi Mahir Wad Ali	M.	22	Copt	Christian	Student	—	+
Idris Wad Osman El Nur	M.	30	Arab	Muslim	Merchant	+	+
Ali Hil Gubara Wad	M.	28	Gaalin	Muslim	Clerk	+	+
Abdalla Wad Ahmed	M.	50	Gaalin	Muslim	Farmer	+	+
Ahmed El Amin Wad Taha	M.	24	Gaalin	Muslim	Merchant	+	+
Hamid Abu Dagig	F.	21	Arab	Muslim	Teacher	+	+
Ahmed Adam Adam	M.	30	Arab	Muslim	Farmer	+	+
Ibrahim Wad Ibrahim	M.	21	Arab	Muslim	Farmer	+	+
Girgis	M.	34	Copt	Christian	Doctor	+	+
Osman Wad Mohd	M.	26	Arab	Muslim	Farmer	+	+
Hamid Abu Gaala	M.	30	Gaalin	Muslim	Farmer	+	+
Mohd Ahmed El Hadi	M.	27	Arab	Muslim	Merchant	—	+
Yusif El Tigani	M.	29	Arab	Muslim	Farmer	+	+
Fatima Kabila	F.	25	Nuba	Muslim	Nurse	+	+
Abbas Ahmed Hamid	M.	28	Arab	Muslim	Farmer	+	+

CASES OF KALA-AZAR FOUND BY COMMISSION—*continued*

Date seen	Duration of Illness	Result	Complications	Remarks
Nov. 25, 1909	1 month	Died, May 16, 1910	Wasting. Slight œdema of feet and face	
Dec. 11, 1909	1 month	Died, Jan. 5, 1910	Œdema of feet and face. Wasting slight	
Nov. 19, 1909	5 months	Died, Jan. 9, 1910	Œdema of feet and face. Wasting marked. Diarrhœa	
Nov. 19, 1909	14 days	Died, Jan. 26, 1910		Had intermittent attacks of Fever for 2 months
Feb. 19, 1910	6 weeks	Died, April 1910	Cancrum Oris. Œdema of feet and face. Wasting	
Jan. 13, 1910	1 month	Died, Jan. 28, 1910	Cancrum Oris. Diarrhœa. Œdema of feet and face	
Jan. 26, 1910	6 weeks	Died, April 2, 1910		
Dec. 9, 1909	6 weeks	Died, Dec. 17, 1909		
Nov. 26, 1909	3 months	Died, Dec. 10, 1909	Œdema of feet and face. Wasting	
Dec. 6, 1909	3 months	Died, Dec. 19, 1909	Pigmentations marked	
Dec. 17, 1909	15 days	Died, Dec. 3, 1909		
Dec. 12, 1909	2 months	Died, Dec. 14, 1909	Œdema of feet and face. Wasting. Apathetic	Case too ill for spleen puncture, spleen was barely palpable
1909	3 months	Died, 1909		Transferred to Cairo
Feb. 15, 1910	1 month	Died, Mar. 20, 1910		
—	2 months	Died, Oct. 11, 1909	Diarrhœa. Œdema of feet and face	This case was treated in Roseires and diagnosed on a post mortem spleen smear
May 27, 1910	5 months	Died, June 23, 1910	Œdema of feet and face. Wasting	
July 26, 1910	4 months	Died, July 26, 1910	Cough with bloody expectoration	Practically *in extremis* when seen
July 26, 1910	2 months	Died, July 31, 1910	Perforating ulcer, large intestine	Sudden perforation of an ulcer at splenic flexure
April 19, 1910	9 months	Died, June 20, 1910		

CASES OF KALA-AZAR CLINICALLY POSITIVE

Name	Sex	Age	Nationality	Village	Markaz	Province	Result	Remarks
Nura Bint Seyid ...	F.	7	Sudan.	Berta	Abu Naama	Sennar	Died	Patient too ill to remove or to have spleen puncture performed. Peripheral blood negative
Mohammed Wad Omar	M.	5	Arab	Adam Hourain	Singa	Sennar	Died	Ditto
Ali Wad Omar	M.	7	Arab	Launi	Abu Naama	Sennar	Unknown	Clinically typical. Peripheral blood negative. Improved under quinine
Abdelnabi Gebara ...	M.	9	Arab	Lueisa	Abu Hashim	Sennar	Unknown	Clinically typical. Peripheral blood negative. Too ill to move or to have spleen puncture performed
Abdel Fattah Saîd ...	M.	26	Sudan.	Roseires	Roseires	Sennar	Died	A post mortem spleen smear was made by M.O., Roseires, but lost. Case stated to be identical with other case which died in hospital and was positive
Khadmallah Bint Rehan	F.	10	Sudan.	—	—	Sennar	Died	Reported by M.O., Roseires
Abdel Hamid El Wahed	M.	50	Arab	Keneiza	Abu Naama	Sennar	Died	Enormous ascites with pressure œdema. Tapped twice. Improved greatly. Died about a month afterwards

CASES REPORTED AS KALA-AZAR BY NATIVES

Name	Sex	Age	Nationality	Village	Markaz	Province	Duration of Illness and Result
Fatima Bint Seyed ...	F.	13	Sudan.	Attib	Abu Naama	Sennar	Died, 5 months
Tindel Wad Dafter ...	M.	11	Sudan.	Wad Daftar	Gedaref ...	Kassala	Died, 3 months
Ahmed Mohd. Ali Atalla	M.	30	Arab	Kakoum	Abu Hashim	Sennar	Died, 2 years
Suleiman Mohd.	M.	40	Tama Arab	Tama	Abu Naama	Sennar	Died, 3 months
Baklat Ali	M.	35	Tama Arab	Tama	Abu Naama	Sennar	Died, 3 months
Hageiza Bint Eturia ...	F.	30	Sudan.	Tama	Abu Naama	Sennar	Died, 2½ months
Ataminno	F.	30	Sudan.	Tama	Abu Naama	Sennar	Died, 2 months
Abdel Rahim Wad Farag	M.	1	Sudan.	Tama	Abu Naama	Sennar	Died, 1 month (son of previous case)
Amina Mamallah	M.	28	Sudan.	—	Abu Hashim	Sennar	Died, 3 months
— Bint Hammam ...	F.	8	Arab	Bados	Roseires	Sennar	Died, 1½ months
Mohd. El Teyeb	M.	50	Arab	Lueisa	Abu Hashim	Sennar	Died, 5 months

Also:—Two Cases, names not obtainable, from Basiak Arabs.
One Case, name not obtainable, from Sudanese.

RESULT OF CASES OF KALA-AZAR REPORTED BY CAPTAIN BOUSFIELD, R.A.M.C.

Name	Sex	Age	Nationality	Village	Markaz	Province	Positive	Suspicious	Present Condition	Remarks
Saleh Mohammed	M.	23	Arab	Abdin	Singa	Sennar	+	—	Healthy	Seen Nov. 15, 1909 and May 29, 1910. Says he has not been ill a day. Seen twice by Captain Bousfield in April, 1909
Ismail Mohammed	M.	...	Arab	Abdin	Singa	Sennar	—	+	Healthy	Spleen puncture showed no Leishman-Donovan bodies
612 Shawish Tisama	M.	30	Arab	...	Gedaref	Kassala	+	—	Healthy	
Ramadan Someet	M.	11	Sudan.	Gallabat	Gallabat	Kassala	+	—	Healthy	
687 W.O. Goma Sadik	M.	30	Arab	...	Gedaref	Kassala	—	+	Healthy	Spleen puncture showed no Leishman-Donovan bodies
Hamed Wad Hamed	M.	...	Arab	Abu Gabid	Gedaref	Kassala	+	—	Dead	
Hawwa Bint Elias	F.	...	Arab	Sherif Seyed	...	...	—	+	Dead	
270 W. O. Mohd. Mahmud	M.	...	Arab	...	Gallabat	...	—	+	Healthy	
Dustabarra	M.	...	Abyss.	...	...	...	—	+	Healthy	
Saleh Ibrahim	M.	...	Arab	...	...	...	—	+	Dead	
Beshir Adam	M.	...	Abyss.	...	...	...	—	+	Healthy	
Wife and child of above	F.	...	Abyss.	...	...	...	—	+	Healthy	
Mohammed Ahmed	M.	...	Arab	Doka	Gedaref	...	—	+	Dead	
Mustafa Mohammed	M.	...	Sudan.	Galet El Nahl	...	...	+	—	Dead	
Maghbone El Mohd	M.	...	Arab	Mafaza	Mafaza	...	—	+	Dead	
Mohd. Ali Nower	M.	...	Arab	Geili	...	...	—	+	Dead	
160 Mohd. Idris KPP...	M.	...	Arab	Mafaza	...	...	—	+	Healthy	
Mohd. Wad Gadulla	M.	...	Arab	Lueisa	Abu Hashim	Sennar	+	—	Dead	
Kazab Abdulla	M.	...	Arab	Singa	Singa	...	+	—	Dead	
1393 Onb. Mahfouz Ayoub	M.	...	Egyp.	...	...	...	+	—	?	Transferred to Cairo
Abdulla Latif	M.	...	Arab	Singa	...	...	+	—	Healthy	
Abdel Kheir	M.	...	Sudan.	Abdin	...	...	+	—	Dead	
Jak Seyid Hegazi	M.	...	Arab	Sennar	Sennar	...	—	+	Healthy	
Babiker El Hag	M.	...	Arab	...	...	...	+	—	Dead	

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